LIABILITY FOR DAMAGE CAUSED BY SPACE OBJECTS UNDER INTERNATIONAL AND NATIONAL LAW

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by

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ABSTRACT

Because of the imposition of State liability for damage inflicted by space objects under the multilateral Space Law Conventions, many States have promulgated national legislation providing licensing, insurance and indemnification by commercial providers. In order to promote commercial operations in space, some States also have capped liability. This article addresses two principal issues: (1) the liability exposure of States for death, injury, or property damage by providers of commercial spaceflight; and (2) how States protect themselves in their domestic legislation through indemnification and insurance requirements in the licensing and regulation of launches, launch sites, launch vehicles, space vehicles and their launch and re-entry. The first part of this article addresses the liability imposed upon States by the Outer Space Treaty, the Rescue Agreement and the Liability Convention, as well as principles of customary International Law. The second part provides a comparative analysis of how States protect themselves from liability through national legislation.

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I. INTRODUCTION

Space objects pose risks to persons and property on the surface of the Earth, to aircraft in flight, and to other space objects in the form of potential collision, debris creation or radio frequency interference. Whereas under the common law, damage would be addressed under the rules of negligence or strict liability, special rules apply with regard to damage caused by aircraft in international carriage or by space objects, and these standards are found in multilateral international conventions on liability. In turn, national governments also have promulgated laws, rules and regulations addressing liability.

One initial difficulty is the uncertain demarcation between air and space which determines which regime and which Convention would apply – Air Law, or Space Law. The complexity will only be compounded as the era of commercial aerospace travel draws closer. The emergence of aerospace vehicles flying passengers into weightless space potentially brings the Space Law regime into play. However, unlike the International Air Law regimes (which impose liability upon the air carrier or the aircraft operator), the Space Law treaties address only the responsibility and liability of States for space activities. By acceding to either the Outer Space Treaty of 1967 [OST], the Rescue Agreement of 1968 [RA], or the Liability Convention of 1972 [LC], the launching or launch-procuring State becomes potentially liable for damages.

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2 See Ram Jakhu, Tommaso Sgobba & Paul Stephen Dempsey, ICAO FOR SPACE?: THE NEED FOR AN INTEGRATED REGULATORY REGIME FOR AIR & SPACE 49-68 (Springer 2011); and C. Brandon Halstead, Hybrid Hops on (and over) the Horizon: The Future Has Arrived and Requires a New Look at Air and Space Law, XXXIV Annals of Air & Space L. 775 (2009).
caused by itself and its commercial launch sector. A ratifying State accepts absolute liability for damage on the ground or to aircraft in flight outside its territory when a launch takes place from its territory or facilities, or when it procures a launch from another State. A State incurs fault-based liability for damage caused in outer space. State liability for damage also may be imposed under customary principles of international law. However the regime is not exclusive in that recourse against the State or the commercial operator under the commonly applicable domestic law of a jurisdiction is not foreclosed.

The U.N. General Assembly has encouraged States to “consider enacting and implementing national laws authorizing and providing for continuing supervision of the activities in outer space of non-governmental entities under their jurisdiction.” States would be well advised to follow this advice to protect themselves from liability, and to protect their citizens and property from damage. At minimum, States should promulgate domestic Space Laws governing licensing, insurance and indemnification.

This article examines the regimes applicable under the international law of State liability for damage caused by space objects, and the national law of liability for owners, operators and launchers of space objects. First, we examine the international conventions speaking to the issue.

II. THE OUTER SPACE TREATY

To understand the Space Law Conventions, one must understand the context in which they were drafted. The decades of the 1960s and 1970s were dominated by the testosterone of the cold war. Then, there were only two space-faring nations – the United States and the Union of Soviet Socialist Republics. The only launches were by States, and most satellites were State military, science, or communications endeavors. Moreover, the infinite vastness of space itself suggested that collisions would be extremely rare events. Hence, these treaties were not drafted during the very hot war in Vietnam, during which Soviet proxies and American soldiers were killing each other and an enormous number of innocent civilians. Tensions between the USA and USSR during this period were intense. Direct conflict was suppressed by a MAD policy (Mutually Assured Destruction) of a thermonuclear holocaust. The Space Law Conventions were, in part, motivated to avoid escalation of potential conflict into yet another arena.

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8 Licensing regulation should be imposed to ensure that the operator and launcher is technically, financially and operationally fit, and has proper compliance disposition with relevant law, including environmental and safety regulation.
10 Indeed, the treaties described herein were negotiated during the very hot war in Vietnam, during which Soviet proxies and American soldiers were killing each other and an enormous number of innocent civilians. Tensions between the USA and USSR during this period were intense. Direct conflict was suppressed by a MAD policy (Mutually Assured Destruction) of a thermonuclear holocaust. The Space Law Conventions were, in part, motivated to avoid escalation of potential conflict into yet another arena.
in today’s era of widespread privately-owned and financed launches, and commercial satellites, or indeed emerging space tourism and transportation, with growing congestion in the geostationary and low-earth orbits, and proliferating space debris.12 Had they been drafted in the contemporary environment, they likely would look quite different, with greater attention and detail given to liability issues, and in particular, the liability of commercial operators, an issue barely on the radar screen a half century ago.

The international space law regime places liability upon the State rather than the launcher or operator, and liability is unlimited.13 Though it was foreseen that “national activities in outer space” would be undertaken by private entities, the Outer Space Treaty14 imposes international responsibility solely upon States.15

Article VI of the Outer Space Treaty explicitly provides that States “shall bear international responsibility for national activities in space . . . whether such activities are carried on by governmental agencies or by non-governmental entities . . . .”16 The treaty also imposes an obligation upon States to authorize and supervise the activities of its nationals in space.17 Article VII provides that any State that launches or procures the launch of an object into outer space,18 and each State from whose territory or facility a space object is launched, is liable for damage to another State or its natural or juridical persons caused by the object or its component parts, whether such damage occurs on the Earth, in the air, or in space.19 Further, Article VIII of the Outer Space Treaty provides that a State “on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object . . . .”20 Professor Hertzfeld

12 “[The Outer Space Treaty] was negotiated long before any states seriously contemplated the possibility of a viable commercial space tourism industry.” Rebekah Reed, Ad Astra Per Aspera: Shaping a Liability Regime for the Future of Space Tourism, 46 Hous. L. Rev. 585, 590-91 (2009).
13 However, certain national laws, such as those of the United States, attempt to limit the liability of space transportation providers.
16 Outer Space Treaty, Art VI.
19 Outer Space Treaty, Art VII.
20 Id. Art. VIII.
notes that, “These three articles, taken together, establish a regime whereby States are liable and responsible for their activities in space as well as those of their companies and citizens.”

III. THE RESCUE AGREEMENT

Building on Articles V and VIII of the Outer Space Treaty, the Rescue Agreement of 1968 reaffirms that astronauts are the “envoys of mankind in space”, and requires that States take all possible steps to rescue and assist astronauts in distress, and return them to the launching State. States are also required to, upon request, provide assistance to launching States in recovering space objects and their component parts that fall to earth outside the launching State’s territory. The “launching authority” (as opposed to the launching State) becomes liable to pay the expenses incurred in recovering or returning a space object or its component parts. The Rescue Agreement recognizes that the launching authority can be either a State or an international intergovernmental organization so long as it accepts the obligations of the Agreement, and so long as most of its State members have ratified the Agreement and the Outer Space Treaty.

IV. THE LIABILITY CONVENTION

A. LAUNCHING STATE

The general principles established by the Outer Space Treaty are elaborated in the 1972 Convention on International Liability for Damage Caused by Space Objects (the “Liability Convention”). Liability is imposed upon the “launching State” for damage caused by a “space object.” Thus, as a threshold matter, one must identify what is contemplated by the launching state. The launching State can be one or more of the following four venues:

1. The State that launches a space object, its component parts, its launch vehicle or parts thereof;

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23 Id. Art. 5(5).
24 Id. Art. 6.

2. The State that procures the launch of a space object, its component parts, its launch vehicle or parts thereof;
3. The State from whose territory a space object, its component parts, its launch vehicle or parts thereof is launched;
4. The State from whose facility a space object, its component parts, its launch vehicle or parts thereof is launched.26

Given the multinational nature of today’s launches, there can be several launching States. For example, the satellite operator and launch procurer can be incorporated in one State, and the launch provider and venue of the launch in another (or from a launch platform on the high seas). 27 Under the Convention, they are jointly and severally liable for any damage they may cause.28

B. SPACE OBJECT

Another threshold question is what is contemplated by the term “space object”? The Convention defines it as including “component parts of a space object as well as its launch vehicle and parts thereof”. Did the drafters intend to draw a distinction between “component parts” of a space object, and “parts” of a launch vehicle? Perhaps so. The French and Spanish language versions of the treaty place a comma after the word “object” and before “as”, suggesting that the space object and launch vehicle are distinct as are their “component parts” and “parts thereof”, respectively. As the problem of proliferation of space debris grows, when metallic shards or specks of paint orbiting at enormous speeds can cause enormous damage to an operating satellite, even rendering it inoperable, the legal question of whether debris constitutes “component parts” becomes more critical. The weight of academic literature by such prominent Space Law scholars as Professors Cheng, Gorove, Kopal and Lee suggests that the term “component parts” should include all launched in-orbit material, including satellite or launch vehicle debris.29

C. ABSOLUTE LIABILITY

The Outer Space Treaty did not specify whether liability was strict, absolute or fault-based.30 The Liability Convention provides a measure, albeit modest, of clarification. Under the Liability Convention, the launching State (defined, again, as a State that launches or procures the launch of a space object, or from whose territory or facility the object is launched) is “absolutely liable”31 for damage caused by a space object to the surface of the Earth or to an aircraft in

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27 Id. at 359-61
28 Liability Convention, supra Art. V(1).
30 Henry Hertzfield, Fault Liability for Third Party Damage in Space: Is Article IV(1)(b) of the Liability Convention Useful Today? (address before the International Institute of Space Law, Prague, Czech Republic, Sept. 29, 2010).
31 Whereas the standard of absolute liability is applicable for surface damage, negligence is the standard for damage caused to a person or property on board another space object “elsewhere than on the surface of the earth”. Liability Convention, Art. III. See generally, Ezra J. Reinstein, Owning Outer Space, 20 NW. J. Int'l L. & Bus. 59, 77 (1999) (criticizing the failure of the treaty to define “fault”). One source summarized the Liability Convention as follows:
“Absolute liability” is used rather than the term “strict liability,” though many sources view the two terms as synonymous. Recoverable damages are allowed for “loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations . . . .”


The possessor of a wild animal is subject to strict liability for harm caused by it even though it would not have happened but for the unexpectable innocent, negligent conduct of a third person, action of another animal or operation of a force of nature. Such liability may therefore be incurred, even without any negligence on the part of the possessor. The Iowa law is in general accord with that of the Restatement. (While some of these cases state the standard is absolute liability, the principles stated are consistent with the Restatement's strict liability. "Even where the owner or keeper of a wild animal is subject to absolute liability, he may still defend on the ground that the injured party voluntarily exposed himself to injury.") Other than the label attached, there is no difference between the "absolute" liability of our cases and the "strict" liability of the Restatement, as applied to the present facts.”

Franken v. City of Sioux Center, Iowa, 272 N.W.2d 422 (Iowa S. St. 1978) (citations omitted).

But other courts see a difference between the two:

“The difference between absolute and strict liability is not one of semantics. Significantly different elements are evaluated by different entities with different standards of review. As used in this opinion, "strict liability" and "absolute liability" signify distinct and separate concepts. Strict liability is imposed where there is a defect in a product due to an individual product flaw, an improper design or an inadequate warning. Irrespective of strict liability, a manufacturer or other seller may nevertheless be liable in an appropriate case under absolute liability. Absolute liability is imposed where, on the basis of policy considerations including risk-spreading, it is determined that a manufacturer or other seller should bear the cost of injuries he causes to foreseeable users, regardless of the presence or absence of any defect. In some circumstances a manufacturer may be liable though a product is free from defects.”


Liability Convention Art. I(a). It is unclear whether recoverable damages include lost wages, lost profits, or non-economic damages such as pain and suffering. Punitive damages are not envisaged. See Joseph J. MacAvoy,
Presumably, this standard was adopted because of the ultrahazardous nature of space activity, as well as the fact that a space object poses nonreciprocal risks to those on the surface of the Earth.\(^{35}\)

**D. FAULT-BASED LIABILITY**

Though absolute liability is the standard for surface damage,\(^{36}\) “fault” is the liability standard under circumstances where a space object causes damage to a space object of another State, or to persons or property on board a space object of another launching State “elsewhere than on the surface of the earth . . .”.\(^{37}\) This would include damage caused to a space object to persons or property on board whether the object is in outer space or in air space.\(^{38}\) Yet the elements of proof needed to establish negligence are nowhere elaborated in the Convention. Moreover, the evidentiary difficulty of establishing facts in an outer space collision is so severe, the likelihood of proving fault when two space objects collide in outer space is nil.\(^{39}\)

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\(^{37}\) Liability Convention, Art. III. States which jointly launch a space object are jointly and severally liable for any damage they may cause. Id. Art. V(1).

\(^{38}\) Professor van der Dunk writes, “when it comes to damage caused to other space objects in outer space, fault liability applies. This already raises, at least in theory, the question of where outer space begins . . . .” Frans G. van der Dunk, *Passing The Buck to Rogers: International Liability Issues in Private Spaceflight*, 86 Neb. L. Rev. 400 (2007). However, Article III of the Liability Convention, addressing liability for negligence, speaks not in terms of damage caused in outer space, but in terms of damage caused “elsewhere than on the surface of the earth”. Damage to a space object occurring in air space surely would meet this standard.

E. JOINT AND SEVERAL LIABILITY

Where damage is caused by a “space object” of one launching State to a space object or persons or property on board a space object of another launching State, and damage is thereby caused to a third State or its persons, the first two States are jointly and severally liable to the third State. They are absolutely liable if the damage to the third State is on to its aircraft in flight or on the surface of the Earth, and liable for negligence if the third State’s space object is in space. In such a situation, each of the first two launching States shall be liable for compensation to the degree of their fault, and if neither can establish the extent of respective fault, the burden of compensation shall be allocated equally between then. Nonetheless, the third State may freely seek full compensation from either of the launching States as joint tortfeasors.

States often contractually allocate damage between them. In some instances, they conclude agreements shifting the potential liability burden from the launching State to the State of the satellite operator. In others, they impose cross-waivers of liability, whereby each participating State in a joint venture accepts its own liability. For example, since 1991, NASA also has included cross-waivers of liability clauses in its launch agreements, International Space Station agreements, and Science or Space Exploration activities agreements with both domestic and foreign partners.

F. DEFENSES

The Convention outlines a limited number of defenses. The launching State may be wholly exonerated from liability if it proves that the damage resulted from the “gross negligence or from an act or omission done with intent to cause damage on the part of a claimant State or of natural or juridical persons it represents”, unless the launch was not in conformity with principles of international law, including in particular, the United Nations Charter or the Outer Space Treaty.

Also, the treaty explicitly excludes from its coverage damage caused to nationals of the launching state, or foreign nationals “during such time as they are participating in the operation of that space object . . . ”, or in the vicinity of the launch or recovery area at the invitation of the

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40 Liability Convention Art. IV(1).
41 Id. Art. IV(2).
43 “NASA has been including cross-waivers of liability in its launch services agreements with U.S. and foreign parties since NASA’s original cross-waiver regulations were published in 1991. By incorporating the cross-waivers of liability into agreements for International Space Station (ISS) activities and Science or Space Exploration activities unrelated to the ISS that involve a launch, each Party, as defined in the cross-waiver, agree to waive all claims against any entity or person defined in the cross-waiver for damage to their property arising out of Protected Space Operations. These cross-waivers also require the parties to extend these cross-waivers to their related entities ensuring those related entities also waive all claims against any entity or person defined in the cross-waiver for damages arising out of Protected Space Operations.” 76 Fed. Reg. 25657-01 (May 5, 2011), 2011 WL 1670039 (F.R.).
44 Liability Convention Art. VI(1). However, under Art. VI(2) this defense is not available if the activities of the launching State are not in conformity with principles of international law.
45 Id. Art. VI.
It is unclear whether a passenger on board a space object is participating in its operation. Arguably, only the flight crew is participating; a passive passenger is not. It is clear that nationals of the launching State may not recover under the Liability Convention, whether they are passengers or crew. But had the drafters intended all persons aboard the space object to be barred from compensation, it likely would have explicitly excluded not only the citizens of the launching State, but the citizens of the foreign State as well. Foreign nationals are precluded from recovery only if they are participating in the space object’s operation or they are in the vicinity of the launch or recovery area by invitation. If they are injured as a result of the negligence of another launching State, recovery is permitted under Article III.  

Professor Steven Freeland argues that since passengers aboard space vehicles have no right of recourse directly against launching States for injuries in outer space, and since commercial operators are likely to attempt to limit their liability to passengers on board the space vehicle contractually, “a uniform and comprehensive regime for passenger liability arising from space tourism activities [should] be developed at the international level . . . [allowing] for direct private claims by passengers and operate from the moment of launch until the return to a final destination.” Another source observes that remedies for damage brought by individuals are precluded under U.S. domestic law, making the “uncertain remedies available to private citizens . . . unjust because the risk of outer space damage to citizens and property is growing as the number of artificial space objects in orbit continues to increase.”

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46 Id. Art. VII.
47 This view is not universally shared. Professor Stephen Hobe argues:
[I]t could be argued that the Liability Convention applies to passengers since they are usually not “participating in the operation” of the space object. Yet, by participating in a space mission, passengers of a space flight voluntarily put themselves at a high risk. Against this background, absolute liability of the launching state for damages caused to passengers of its space object seems inappropriate. Moreover, Article III of the Liability Convention clearly refers to cases where third parties are involved, so that fault-based liability cannot be applied with respect to passengers. Therefore, passengers likely cannot claim compensation under the Liability Convention.
Whatever the final form of regime, it is clear that the existing rules of space law, which rely solely on state responsibility and liability, are not appropriate for an industry that will principally be undertaken as a private commercial venture. Moreover, this regime must address not only issues of passenger liability but also third party liability. A new multilateral treaty should be developed to establish a system of liability that attaches to those private operators conducting space tourism activities.

49 Joel Stroud, Space Law Provides Insights on How the Existing Liability Framework Responds to Damages Caused by Artificial Outer Space Objects, 37 Real Prop. Prob. & Tr. J. 363, 375 (2002). Another source concurs:
disagrees: “[T]he Liability Convention does not impose domestic tort liability standards and does not preclude individuals from pursuing remedies in domestic courts. Individuals are allowed to file negligent tort claims in U.S. domestic courts for damage caused by [commercial human space flight] vehicles to objects or persons in outer space, subject to the laws of the United States.”

G. PROCEDURAL ISSUES

The Liability Convention establishes procedures for the settlement of claims, including a one year period of limitations in which to bring a claim and, where necessary, establishment of a Claims Commission. Claims must be presented through diplomatic channels by a State on its behalf, or on behalf of its nationals. Should the State whose natural or juridical persons suffered damage decline to file a claim, another State may present a claim for damages sustained in its territory by any natural or juridical person. If neither the State of nationality nor the State in whose territory the damage was sustained files a claim, another State may file a claim for damages suffered by its permanent residents. Individuals incurring harm have no right of direct action, as suit must be brought by a State, a right which no State has yet exercised with respect to an individual’s losses.

Experts do not concur on the issue of whether domestic causes of action are retained. One source claims the “uncertain remedies available to private citizens . . . [are] unjust because the risk of outer space damage to citizens and property is growing as the number of artificial space objects in orbit continues to increase.” However, another source opines: “[T]he Liability Convention does not impose domestic tort liability standards and does not preclude individuals from pursuing remedies in domestic courts. Individuals are allowed to file negligent tort claims [sic] in U.S. domestic courts for damage caused by [commercial human space flight] vehicles to objects or persons in outer space, subject to the laws of the United States.”

“Relevant U.S. case law from incidents in Antarctica suggests that potential plaintiffs with causes of action arising in outer space could not overcome the [Federal Tort Claims Act]. Outer space qualifies as a sovereignless area, therefore, the FTCA does not recognize outer space tort claims.” R. Thomas Rankin, Space Tourism: Fanny Packs, Ugly T-Shirts, and the Law in Outer Space, 36 Suffolk U. L. Rev. 695, 716-17 (2003).


Id. Art. X, XIV-XX.


51 Liability Convention Art. VIII.


The Liability Convention explicitly does not prevent a State, “or natural or juridical persons it might represent, from pursuing a claim in the courts or administrative tribunals or agencies of a launching State.”\(^{57}\) Thus, though domestic law may preclude a suit brought by an individual for damages in space, the Convention does not.

V. CUSTOMARY INTERNATIONAL LAW

Whether or not a State has ratified or acceded to the Outer Space Treaty, the Rescue Agreement or/ or the Liability Convention, it may still face potential liability under customary international law.\(^{58}\) Under general principles of customary international law, no State has the right to use or permit the use of its territory in such a way as to cause injury in or to another territory,\(^{59}\) and a State must pay reparations for transborder damage.\(^{60}\)

As an example, the 1978 crash of the Cosmos 954 satellite into Canada, creating damages totaling $14 million, led Canada to file a $6 million claim with the (then) Soviet Union, of which $3 million was eventually paid.\(^{61}\) The settlement agreement declared, “The standard of absolute liability for space activities, in particular activities involving the use of nuclear energy, is considered to have become a general principle of international law.”\(^{62}\)

VI. NATIONAL SPACE LAW

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\(^{57}\) Liability Convention, Art. XI(2).


\(^{60}\) “The polluter pays principle—which is an economic concept that allocates the costs of both preventing and remedying environmental damage to the source of that damage—has at least arguably risen to the level of customary international law, considering the number of international instruments that mention it . . . .” Suriya E.P. Jayanti, *Recognizing Global Environmental Interests: A Draft Universal Standing Treaty for Environmental Degradation*, 22 Geo. Int'l Envtl. L. Rev. 1, 13 (2009). The “prohibition of significant cross-border environmental damages is customary international law.” Pauline Abadie, *A New Story of David and Goliath: The Alien Tort Claims Act Gives Victims of Environmental Injustice in the Developing World a Viable Claim Against Multinational Corporations*, 34 Golden Gate U. L. Rev. 745, 787 (2004). “Under the principle *sic utere tuo ut alienum non laedas*, a state has a duty to refrain from acts that would cause injury to persons or property located in the territory of another state.” Editors of the Harv. L. Rev., *Trends In International Environmental Law* 19 (1992). The contours of this principle, probably more than any other, will determine the legal rights and responsibilities in most disputes regarding transnational environmental damage and can be considered a part of customary international law.” DAVID HUNTER ET AL., *INTERNATIONAL ENVIRONMENTAL LAW AND POLICY* 345 (1998).


\(^{62}\) *Canada’s Claim Against the U.S.S.R. Arising Out of the Cosmos 954 Incident and the Claim’s Settlement* ¶ 22 in *SPACE LAW* § IV>B.Canada.1-4 (Paul Stephen Dempsey ed. 2004).
The most important reason that States regulate space activities is a because of their international responsibility for such activities. The combination of liability imposed by both conventional and customary international law is a powerful motivator for States to promulgate legislation ensuring that launches and other space activities are conducted safely by financially responsible entities, and to address the issues of State liability should they arise. This section examines the principal provisions addressing liability in national space legislation.

A. STATE LIABILITY

A number of Space Law statutes promulgated by States essentially restate the obligations imposed upon them in the Outer Space and Liability Conventions. This phenomenon probably reflects the requirement that certain States have to embody international obligations into national legislation, as treaty obligations in some States are not domestically obligatory without their incorporation into domestic law.

The liability provisions of the Russian Federation’s Law on Space Activities are nearly verbatim those imposed by Articles II and III of the Liability Convention. Japan has recognized its absolute liability to pay compensation for damage caused to foreign states and their nationals for damage caused by Japanese space objects.

Brazil recognizes that “liability for damages due to space launching shall be settled in accordance with space treaties and conventions to which Brazil is signatory . . . .” One source interprets this clause to mean that Brazil accepts liability with regard to all space objects launched from its territory, even those launched privately. Further, under Brazilian law, liability extends to intergovernmental agencies as well as the environment.

Argentina established a National Commission on Space Activities whose Resolution 330 provides, “the Argentine State is absolutely liable for damages caused by . . . space objects launched from its territory or procured by public or private entities under its jurisdiction.” The imposition of absolute liability goes beyond the requirements of the Liability Convention, which limits liability to other space objects to situations in which the launching State has caused harm due to its negligence. China is considering draft legislation to implement its obligations assumed under the 1972 Liability Convention.

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64 Sergey Malkov & Catherine Doldirina, Regulation of Space Activities in the Russian Federation, in NATIONAL REGULATION OF SPACE ACTIVITIES 315, 328 (Ram Jakhu, ed., Springer 2010).
65 Setsuko Aoki, Regulation of Space Activities in Japan, in NATIONAL REGULATION OF SPACE ACTIVITIES 199, 209 (Ram Jakhu, ed., Springer 2010).
66 Jose Monserrat Filho, Regulation of Space Activities in Brazil, in NATIONAL REGULATION OF SPACE ACTIVITIES 61, 76 (Ram Jakhu, ed., Springer 2010).
67 Id. at 76-77.
68 Id. at 76.
69 Julian Hermida, Regulation of Space Activities in Argentina, in NATIONAL REGULATION OF SPACE ACTIVITIES 23, 26 (Ram Jakhu, ed., Springer 2010).
70 Yun Zhao, Regulation of Space activities in the People’s Republic of China, in NATIONAL REGULATION OF SPACE ACTIVITIES 247, 249 (Ram Jakhu, ed., Springer 2010).
But some States have not promulgated legislation addressing liability. This places them at risk. Dr. Kaul and Professor Jakhu note the problems the absence of national laws pose for space-faring States such as India:

[T]he absence of specific national law does not by itself absolve India from the liability or the obligation to pay . . . damages should an Indian space object cause damage or loss to the space object, personnel or property of a foreign country or entity. The most important reason for national legislation is that not only will it enable India [to] discharge liability by paying compensation to a foreign state and/or third parties, but also, such a law will establish: (i) actionable legal rights in favor of Indian entities operating in space and Indian citizens to claim compensation for damage sustained; (ii) a regulated claims mechanism; and (iii) a set claims procedure.\(^\text{71}\)

The United States has statutorily immunized itself from “any suit in any court for any cause of action arising from the provision or receipt of space situational awareness [SSA] services or information . . . .”\(^\text{72}\) Although the United States can absolve itself from liability for claims filed by its citizens under the Federal Tort Claims Act, whether it can do so internationally under the Outer Space and Liability Conventions is doubtful.\(^\text{73}\)

Article VI of the OST imposes liability on States for their "national activities in space" which would include SSA. Article VII imposes liability upon the launching or procuring State for damages caused by its space object. A monitoring satellite used for SSA might well qualify as a space object. The OST does not require the space object be involved in a collision, but merely that it causes "damage". Similarly, Articles II and III of the Liability Convention impose liability for "damage" caused by a space object. Could not such damage include errant navigational information that leads to injury of persons or property in space or on the surface?

\section*{B. INDEMNIFICATION}

Certain States make it clear that those engaging in space activities have a duty to indemnify the State should it become liable. One source observes:

One of the important aspects of a national regulatory framework for space activities is to establish a regime where the State can 'set off' its financial risk in relation to damage caused to third parties. While this does not result in the extinguishment of the legal liability of the State under the terms of the Outer Space Treaty and the Liability Convention, it does

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71 Ranjana Kaul \& Ram Jakhu, \textit{Regulation of Space Activities in India}, in \textit{National Regulation of Space Activities} 153, 159 (Ram Jakhu, ed., Springer 2010). See also id. at 163, 174, and 189.
72 10 U.S.C. § 2274(g).
73 Hertzfeld and Baseley-Walker argue that the U.S. arguably could have been held liable under negligence for failure to warn Iridium of the danger of possible collision by its satellite with Cosmos 2251 on Feb. 10, 2009. Henry Hertzfeld \& Ben Baseley-Walker, \textit{A Legal Note on Space Accidents}, Zeitschrift für Luft-und Weltraumrecht [German J. of Air \& Space L.] 230, 237 (2010).
}
provide a degree of financial comfort, by facilitating the passing on of the financial responsibility down to the entity directly engaged in the activity.\textsuperscript{74}

Indemnification under national Space Law legislation is of three types:

1. Indemnification of the State
2. Indemnification by the State
3. Indemnification of third parties

\textbf{1. Indemnification of the State}

Many States require that commercial operators indemnify them should they be deemed liable. Belgium enacted legislation that provides that, “When the Belgian State is liable, pursuant to Article VII of the Outer Space Treaty, the provisions of the Convention on International Space Liability or provisions of this law, for reparation, it shall have the right to institute a counterclaim against the operator(s) involved up to the amount of the compensation . . . .”\textsuperscript{75} Similarly, in the Netherlands, if the government “is obliged to pay compensation under Article VII of the Outer Space Treaty or the Liability Convention, the State is entitled to recover this sum, in full or in part, from the party whose space activity has caused the damage.”\textsuperscript{76} Australia and the Russian Federation also require State reimbursement from damage caused by private operators.\textsuperscript{77}

In Hong Kong, one who launches or procures the launch of a space object, operates a space object, or engages in any activity in space “shall indemnify the Government and the Central People’s Government against any claims brought against either government in respect of damage or loss arising out of such activity carried on by him.”\textsuperscript{78} Similarly, South Korean legislation provides that should it pay compensation under the Liability Convention, “the Korean government may present a claim for indemnification to the launching party.”\textsuperscript{79}

In the United Kingdom, one who launches, procures the launch, operates a space object, or engages in any activity in outer space must indemnify the British government for “damage or loss arising out of activities carried on by him . . . .”\textsuperscript{80} Indemnification is required to the U.K.

\textsuperscript{74} Noel Siemon & Steven Freeland, \textit{Regulation of Space Activities in Australia}, in \textsc{National Regulation of Space Activities} 37, 54 (Ram Jakhu, ed., Springer 2010).
\textsuperscript{75} Law on the Activities of Launching, Flight Operations or Guidance of Space Objects Art. 15 in \textsc{Space Law} § IV.B.Belgium.1.1 (Paul Stephen Dempsey ed. 2005). Belgium requires that damages to Belgian nationals be resolved by an arbitration panel of three arbitrators. Id.
\textsuperscript{76} Franz van der Dunk, \textit{Regulation of Space Activities in the Netherlands}, in \textsc{National Regulation of Space Activities} 225, 242 (Ram Jakhu ed., Springer 2010).
\textsuperscript{78} Hong Kong Outer Space Ordinance § 12 in \textsc{Space Law} § IV.B. Hong Kong.1-1 (Paul Stephen Dempsey ed. 2005).
\textsuperscript{79} Space Liability Act, Law No. 8852, Art. 3 (Dec. 21, 2007).
government for claims presented under the Liability Convention. French law requires Arianespace to indemnify the French government up to €60 million per launch in case of damage caused by Ariane.  

Sweden too, requires reimbursement of liability incurred by the State, though no precise amount is specified in the relevant decrees, suggesting that liability is unlimited. Should Sweden be deemed liable for damages as a result of space activities, those who have carried on such activities must reimburse the government for the amounts disbursed “unless special reasons tell against this.”

Argentina does not have specific legislation or regulations allowing the State to recover sums it is obliged to pay under the Liability Convention from a commercial enterprise which caused the damage. Liability for such acts falls under the general Civil Code, which prescribes general rules and principles governing liability. Neither does the United States have a provision governing indemnification, though as revealed below, the U.S. does require the private operator to obtain insurance payable to the Government.

2. Indemnification by the State

In Japan, the national space agency, JAXA, assumes “the entire liabilities of those parties related to the Consigned Launch for compensation for the damage” unless the damage was caused by willful misconduct, in which case JAXA has a right of indemnification from the parties for damages paid.

Italy enacted a law enabling its citizens to obtain compensation from the State for damages “to the extent which the Italian State has requested and obtained, in accordance with Article VIII, n. 1 of the [Liability] Convention, compensation from the launching State for damage caused to them.” The Italian State must compensate its citizens for damages “even when it has formulated a request under Article VIII, n. 1 of the Convention but that request remains unsatisfied.”

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81 J.A. Vedda, STUDY OF THE LIABILITY RISK-SHARING REGIME IN THE UNITED STATES FOR COMMERCIAL SPACE TRANSPORTATION 50 (USDOT Volpe Center 2006).
82 J.A. Vedda, STUDY OF THE LIABILITY RISK-SHARING REGIME IN THE UNITED STATES FOR COMMERCIAL SPACE TRANSPORTATION 48 (USDOT Volpe Center 2006).
85 Julian Hermida, Regulation of Space Activities in Argentina, in NATIONAL REGULATION OF SPACE ACTIVITIES 23, 28 (Ram Jakhu, ed., Springer 2010).
89 Id. Art. 3. The statute imposes a five year limitation on such action “following the date on which the damage occurred or of the date on which the effects of that damage are exhausted.” Id. Art. 4.
Russia, too, imposes liability upon itself by legislation. The Russian Federation guarantees “full compensation for direct damage inflicted as a result of accidents while carrying out space activity” in accordance with its legislation.\textsuperscript{90} Liability for surface damage is strict, while liability for damage to another space object is fault-based.\textsuperscript{91} In Russia, those who have indemnified injured parties for damages sustained enjoy a right of recourse against others, with liability apportioned according to their degree of fault. If relative fault cannot be established, liability shall be shared equally.\textsuperscript{92}

3. **Indemnification of Third Parties**

Australia imposes liability upon the “responsible party” for the launch or return of a space object\textsuperscript{93} He is obliged to pay compensation for damages caused to third parties on Earth, to an aircraft in flight, to a space object, or to the third party or their property on board the space object.\textsuperscript{94} In South Africa, the space agency may specify the liability of the licensee for damages. The licensee may not limit or exclude its liability.\textsuperscript{95}

Korea imposes liability for damages upon the “person who launches space objects”.\textsuperscript{96} The launching party who pays compensation for damage caused by a third party’s willful misconduct or negligence may seek indemnification from that party. But if the damage was caused by the supply of components, materials or services, the launching party may recover “only if the damage is due to willful misconduct or gross negligence . . . .”\textsuperscript{97}

C. **INSURANCE REQUIREMENTS**

Building a satellite and launching it into space can be enormously expensive investments, with a satellite costing around $200 million and the launch costing around $100 million. Risk allocation in the satellite procurement contract typically absolves the manufacturer from liability once the satellite is launched; risk allocation in the launch contract also typically absolves the launching party for liability for launch failure. The satellite operator therefore will insure risks that it is unable to shift contractually to other parties.

Many States require that launch and operational certificate or permit holders carry insurance to cover liability. But irrespective of whether the State requires insurance to cover the

\textsuperscript{90} Law of the Russian Federation About Space Activity, Decree No. 5663-1 Art. 30(1), in SPACE LAW § IV-B.Russia.1-7 (Paul Stephen Dempsey ed. 2004).
\textsuperscript{91} Id. Art 30(3).
\textsuperscript{92} Id. Art. 30(3).
\textsuperscript{93} Included among such “responsible parties” are for example, defined as the holder of a launch permit (in the case of a launch or return authorized thereby), the holder of a permission (in the case of a return authorized thereby), a person authorized by the Minister for a return. Australia Space Activities Act 1998 No. 123, 1998, § 8, in SPACE LAW § IV.B.Australia.1.1 (Paul Stephen Dempsey ed. 2004).
\textsuperscript{95} Space Affairs Act No. 84 of 1993, Art. 14(1)(a), (2)(a) in SPACE LAW § IV.B. South Africa.1-1 (Paul Stephen Dempsey ed. 2004).
\textsuperscript{97} Space Liability Act, Law No. 8852, Art. 4.2 (Dec. 21, 2007).
potential damage suffered by the State itself, or its citizens, the creditor will require the satellite operator to carry insurance to cover the risk of loss, and require that such insurance be made payable to the creditor. Such insurance typically costs around 15% of the total manufacturing and launch costs. Insurance is of two basic types: (1) that covering launch facilities and space objects (launch and in-orbit); and (2) that covering third party and products liability.

Many States impose insurance requirements upon commercial space operators. For example, in Australia, the holder of a launch permit, overseas launch certificate or other authorization must carry insurance against any liability caused by damage to a third person, and covering any liability that Australia might incur “under the Liability Convention or otherwise under international law” in an amount not less than “the maximum probable loss that may be incurred in respect to damage to third parties caused by the launch or return . . .” Total insurance coverage is based on the lesser of A$750 million or the “maximum probable loss”.

In the United Kingdom, commercial space operators must carry at least £100 million in third-party liability insurance for launch or in-orbit states of an outer space mission. Insurance must also cover the expenses incurred by the U.K. government.

Similarly, in Korea, those seeking a launch license must procure insurance in “an amount [specified by the Ministry of Science and Technology] capable to compensate for damages occurring in possible space accidents.” The amount shall be set “with consideration of the characteristics of space objects, the difficulties of technology, circumstances around the launch site and the domestic and foreign insurance markets.”

Brazil too, requires a licensee to procure insurance “to cover possible damages to third parties, according to the degree of risk of the activities to be carried out by the applicant . . .” in an amount specified by the Brazilian Space Agency [AEB]. The licensee must carry insurance “to cover damages to third parties that might be involved in each space launching operation . . .”

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99 “Two main types of space insurance exist for space activities: insurance of space objects and liability insurance (including third-party liability and product liability). Insurance of space objects can be further differentiated into: ‘(1) pre-launching insurance; (2) launch failure and initial operation insurance; and (3) insurance of the satellite itself.’ The first satellite insurance contract (insurance of space objects) providing for pre-launching insurance services was concluded in 1965 for Intelsat’s ‘Early Bird.’” Zhao Yun, A Legal Regime for Space Tourism: Creating Legal Certainty in Outer Space, 74 J. Air L. & Com. 959, 969-70 (2009) [citations omitted].
101 Noel Siemon & Steven Freeland, Regulation of Space Activities in Australia, in NATIONAL REGULATION OF SPACE ACTIVITIES 37, 55 (Ram Jakhu, ed., Springer 2010).
102 J.A. Vedda, STUDY OF THE LIABILITY RISK-SHARING REGIME IN THE UNITED STATES FOR COMMERCIAL SPACE TRANSPORTATION 50 (USDOT Volpe Center 2006).
104 Space Liability Act, Law No. 8852, Art. 6.2 (Dec. 21, 2007).
105 Jose Monserrat Filho, Regulation of Space Activities in Brazil, in NATIONAL REGULATION OF SPACE ACTIVITIES 61, 76 (Ram Jakhu, ed., Springer 2010).
with the AEB establishing the insurance value. Coverage must include damages for “loss of life, personal injuries, or other damage to health, loss of State property or of natural or legal persons’ property, or damage inflicted to such property.”

In Ukraine, insurance in an amount set by legislation is compulsory in connection with space activity. In China, a licensee must “insure himself against liability incurred in respect to damage or loss suffered by third parties and against other liability incurred by launching a space object.” The licensee must purchase third-party liability insurance of $100 million or the maximum amount available on the world market, and such coverage must remain in effect for two years following the launch.

In Russia, those who “exploit space technology . . . shall take compulsory insurance coverage in the amount set by legislation . . . .” Such insurance shall cover damage caused by a space object “to the life and health of the cosmonauts and the personnel at the ground and other objects of space infrastructure, as well as against property damage to third persons.” The amount of insurance is determined by the Russian Space Agency, Roscomos, and depends on the specific launch vehicle. The level ranges from $80 million for Start launch vehicles, up to $300 million for Soyuz and Proton. If the launch contract so specifies, the Russian government pays damages in excess of the level of insurance coverage; if not, the launch customer is liable for such claims. Those who fail to discharge this duty may be refused a license for a commercial space project, or once issued, have the license suspended or terminated.

In Japan, the Japanese space agency (JAXA) may not launch a satellite without first entering into an insurance contract. Where the launch is to be made by another entity, that person shall enter into an insurance contract “for and on behalf of the Agency.” The statute does not specify the insurance amount. It does provide that the amount of compensation allowed under the insurance contract shall be specified by the Minister of Education, Culture, Sports, Science and Technology, and shall be in an amount appropriate for the protection of victims.
Similarly, in South Africa, the space agency may specify the security to be given by the licensee for damages.\textsuperscript{116}

Though India has ratified the relevant international Conventions, it has enacted no domestic law to harmonize them and meet its international legal obligations at the domestic level. However, the government protects its State-owned Indian Space Research Organization by procuring third party insurance up to $100 million.\textsuperscript{117}

U.S. and foreign air carriers operating in the United States must carry insurance to cover potential liability to passengers and persons and property on the ground. For aircraft with more than 60 seats or more than 18,000 pounds of capacity, air carriers must maintain third-party accident liability coverage in the minimum amount of $300,000 for any one person other than a passenger and $20 million per aircraft per occurrence.\textsuperscript{118}

Insurance requirements to cover liability for space launches and objects, though also regulated by the U.S. Federal Aviation Administration [FAA], is regulated differently. Regulations promulgated by the FAA under the Commercial Space Launch Amendments Act of 2004 require insurance to cover:

1. The licensee or permittee, its customer, and their respective contractors and subcontractors, and the employees of each, involved in a licensed or permitted activity;
2. The United States, its agencies, and its contractors and subcontractors involved in a licensed or permitted activity; and

The United States requires that launch and reentry licensees\textsuperscript{119} and permittees\textsuperscript{120} obtain liability insurance or otherwise demonstrate their ability to cover the “maximum probable loss”

\textsuperscript{117} J.A. Vedda, STUDY OF THE LIABILITY RISK-SHARING REGIME IN THE UNITED STATES FOR COMMERCIAL SPACE TRANSPORTATION 50 (USDOT Volpe Center 2006).
\textsuperscript{119} 14 CFR § 413.3 Who must obtain a license or permit:
(a) A person must obtain a license in accordance with this section, unless eligible for an experimental permit under paragraph (f) of this section.
(b) A person must obtain a license to—
(1) Launch a launch vehicle from the United States;
(2) Operate a launch site within the United States;
(3) Reenter a reentry vehicle in the United States; or
(4) Operate a reentry site within the United States.
(c) A person who is a U.S. citizen or an entity organized under the laws of the United States or any State must obtain a license to—
(1) Launch a launch vehicle outside the United States;
(2) Operate a launch site outside the United States;
(3) Reenter a reentry vehicle outside the United States; or
(4) Operate a reentry site outside the United States.
\textsuperscript{120} 14 CFR § 437.5 Eligibility for an experimental permit:
to third parties for death, bodily injury or property damage, and to the U.S. government for property damage. The FAA requires that licensees and permittees carry insurance to cover third party liability in the lesser amount of either: (1) $500 million; or (2) the maximum liability insurance available on the world market at a reasonable cost. To cover liability to the United States, its agencies, and its contractors and subcontractors, the licensee or permittee must carry insurance in the lesser amount of either: (1) $100 million; or (2) the maximum liability insurance available on the world market at a reasonable cost. In lieu of insurance, the licensee or permittee can demonstrate that it has sufficient financial resources to self-insure. However, a 2006 study

The FAA will issue an experimental permit to a person to launch or reenter a reusable suborbital rocket only for—
(a) Research and development to test new design concepts, new equipment, or new operating techniques;
(b) A showing of compliance with requirements for obtaining a license under this subchapter; or
(c) Crew training before obtaining a license for a launch or reentry using the design of the rocket for which the permit would be issued.


14 C.F.R. § 440.9 Insurance requirements for licensed or permitted activities:
(a) As a condition of each license or permit, a licensee or permittee must comply with all insurance requirements of this section and of a license or permit issued by the FAA, or otherwise demonstrate the required amount of financial responsibility.
(b) A licensee or permittee must obtain and maintain in effect a policy or policies of liability insurance, in an amount determined by the FAA under paragraph (c) of this section, that protects the following persons as additional insureds to the extent of their respective potential liabilities against covered claims by a third party for bodily injury or property damage resulting from a licensed or permitted activity:
(1) The licensee or permittee, its customer, and their respective contractors and subcontractors, and the employees of each, involved in a licensed or permitted activity;
(2) The United States, its agencies, and its contractors and subcontractors involved in a licensed or permitted activity; and
(3) Government personnel.
(c) The FAA will prescribe for each licensee or permittee the amount of insurance required to compensate the total of covered third-party claims for bodily injury or property damage resulting from a licensed or permitted activity in connection with any particular launch or reentry. A covered third-party claim includes a claim by the United States, its agencies, and its contractors and subcontractors for damage or loss to property other than property for which insurance is required under paragraph (d) of this section. The amount of insurance required is based upon the FAA’s determination of maximum probable loss; however, it will not exceed the lesser of:
(1) $500 million; or
(2) The maximum liability insurance available on the world market at a reasonable cost, as determined by the FAA.
(d) The licensee or permittee must obtain and maintain in effect a policy or policies of insurance, in an amount determined by the FAA under paragraph (e) of this section, that covers claims by the United States, its agencies, and its contractors and subcontractors involved in a licensed or permitted activity for property damage or loss resulting from a licensed or permitted activity. Property covered by this insurance must include all property owned, leased, or occupied by, or within the care, custody, or control of, the United States and its agencies, and its contractors and subcontractors involved in a licensed or permitted activity.
commissioned by the U.S. government concluded that private insurance market was “fragile” and unable to provide full coverage to launch providers, with only $300 million of coverage available in 2001.\footnote{\textcopyright J.A. Vedda, \textit{Study of the Liability Risk-Sharing Regime in the United States for Commercial Space Transportation} (USDOT Volpe Center 2006).} The volatility in the market can be explained on the basis that satellites and launch vehicles are extremely expensive, and the risk of catastrophic loss is relatively high, and there are relatively few customers over which to spread the risk.\footnote{Rebekah Reed, \textit{Ad Astra Per Aspera: Shaping a Liability Regime for the Future of Space Tourism}, 46 Hous. L. Rev. 585, 597-98 (2009).}

While neither the United Kingdom nor South Africa have legislation requiring a private operator to carry third party insurance, both grant their space agencies discretionary authority to impose such a requirement as a licensing condition on a case-by-case basis.\footnote{Ricky J. Lee, \textit{The Liability Convention and Private Space Launch Services}, XXXI Annals of Air \\& Space L. 351, 377 (2006).}

\section*{D. LIABILITY CAPS}

Although the liability for damage caused by space objects of the launching State is unlimited, in order to promote commercial activities in space, a number of States have imposed liability caps to shield commercial actors from unlimited liability. One source argues for complete absolution of liability for commercial space operators: “Given the significant risks and high costs associated with space ventures and the benefits the government will realize as a result of increased commercial space activity, those involved in private space ventures should be given immunity from negligence claims arising out of space-based activities.”\footnote{Susan Trepczynski, \textit{The Benefits of Granting Immunity to Private Companies Involved in Commercial Space Ventures}, XXXI Annals of Air \\& Space L. 381, 382 (2006).} Though no State has gone that far, in order to facilitate the ability of their nationals to engage in space activities, as well as promote the investment in and commercialization of space, certain States cap the liability of a permit or certificate holder.

For example, in South Africa, the space agency may “limit or exclude the liability of the licensee concerned regarding damages that may be caused (whether or not such licensee is at activity, at a Federal range facility. Insurance must protect the United States and its agencies, and its contractors and subcontractors involved in a licensed or permitted activity. (e) The FAA will prescribe for each licensee or permittee the amount of insurance required to compensate claims for property damage under paragraph (d) of this section resulting from a licensed or permitted activity in connection with any particular launch or reentry. The amount of insurance is based upon a determination of maximum probable loss; however, it will not exceed the lesser of: (1) $100 million; or (2) The maximum available on the world market at a reasonable cost, as determined by the FAA. (f) In lieu of a policy of insurance, a licensee or permittee may demonstrate financial responsibility in another manner meeting the terms and conditions for insurance of this part. The licensee or permittee must describe in detail the method proposed for demonstrating financial responsibility and how it ensures that the licensee or permittee is able to cover claims as required under this part. See generally, Petra Vorwig, \textit{Regulation of Private Launch Services in the United States}, in \textit{National Regulation of Space Activities} 405, 412-13 (Ram Jakhu, ed., Springer 2010).}
fault) by a launch vehicle of spacecraft or anything on or in such a launch vehicle of spacecraft, or is being done therein or is originating therefrom. . . .”¹²⁸ The Brazilian Space Agency AEB assures that the Brazilian government will cover liability above the operator’s liability insurance coverage.¹²⁹ China too, will cover damages exceeding the required third-party liability insurance coverage.¹³⁰

In South Korea, the maximum liability of the launching party is 200 billion won.¹³¹ Further, unless the damage is due to its willful misconduct or negligence, it is absolved from liability if the damage was “caused by armed conflict, hostile activity, civil war or rebellion or caused in outer space . . . .”¹³² France limits liability for in-orbit activities to one year; after that, the State steps in and covers liability.¹³³ France does not cap the government’s liability for third-party claims.¹³⁴

Australia limits liability to the insured amount, so long as the damage did not result from a breach of the certificate conditions, was intentionally caused, or was the result of gross negligence.¹³⁵ Beyond the insurance coverage of the lesser of A$750 million or the “maximum probable loss”, discussed above, the government of Australia commits to indemnifying the launch operator to a maximum of A$3 billion. This cap on liability was considered essential in order to enhance the financial viability of commercial space operations.¹³⁶ The liability period is defined as 30 days from the launch, and from the beginning of re-entry until the object comes to rest on the Earth.¹³⁷

Liability for damage caused by commercial space operators in United States’ law is divided into three tiers:

**Tier 1: Maximum Probable Loss.** In the first tier, as noted above, the United States caps commercial operator liability at the “maximum probable loss” as set by the U.S. Federal Aviation Administration. For third persons, the maximum probable loss is the lesser of $500 million or the “maximum liability insurance available on the world market at a reasonable cost”, and for the Government, the lesser of $100 million or the maximum insurance available at

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¹²⁹ J.A. Vedda, STUDY OF THE LIABILITY RISK-SHARING REGIME IN THE UNITED STATES FOR COMMERCIAL SPACE TRANSPORTATION 47 (USDOT Volpe Center 2006).
¹³⁰ J.A. Vedda, STUDY OF THE LIABILITY RISK-SHARING REGIME IN THE UNITED STATES FOR COMMERCIAL SPACE TRANSPORTATION 48 (USDOT Volpe Center 2006).
¹³¹ Space Liability Act, Law No. 8852, Art. 5 (Dec. 21, 2007).
¹³² Space Liability Act, Law No. 8852, Art. 4.1 (Dec. 21, 2007).
¹³³ Henry Hertzfeld, Fault Liability for Third Party Damage in Space: Is Article IV(1)(b) of the Liability Convention Useful Today? (address before the International Institute of Space Law, Prague, Czech Republic, Sept. 29, 2010).
¹³⁶ Noel Siemon & Steven Freeland, Regulation of Space Activities in Australia, in NATIONAL REGULATION OF SPACE ACTIVITIES 37, 55 (Ram Jakhu, ed., Springer 2010).
¹³⁷ J.A. Vedda, STUDY OF THE LIABILITY RISK-SHARING REGIME IN THE UNITED STATES FOR COMMERCIAL SPACE TRANSPORTATION 46 (USDOT Volpe Center 2006).
reasonable cost.\textsuperscript{138} The Government may pay the first dollar of loss should the event be declined coverage by the insurer under a policy exclusion deemed “usual.”\textsuperscript{139}

**Tier 2: Governmental Coverage of Catastrophic Loss.** If the amount of liability exceeds the amount available in the first tier, the second tier kicks in, in which the U.S. Government will pay damages up to \$1.5 billion (in January 1, 1989, dollars, adjusted for inflation) above the first tier, unless the claim for bodily injury or property damage is made by a party whose willful misconduct caused the damage.\textsuperscript{140} Given the gargantuan size of the federal debt, it is unclear

\begin{itemize}
\item \textsuperscript{138} Petra Vorwig, *Regulation of Private Launch Services in the United States*, in *National Regulation of Space Activities* 405, 412 (Ram Jakhu, ed., Springer 2010).
\item \textsuperscript{139} J.A. Vedda, *Study of the Liability Risk-Sharing Regime in the United States for Commercial Space Transportation* 1 (USDOT Volpe Center 2006).
\item \textsuperscript{140} 14 CFR § 440.19 United States payment of excess third-party liability claims:
\begin{enumerate}
\item The United States pays successful covered claims (including reasonable expenses of litigation or settlement) of a third party against a licensee, a customer, and the contractors and subcontractors of the licensee and the customer, and the employees of each involved in licensed activities, and the contractors and subcontractors of the United States and its agencies, and their employees, involved in licensed activities to the extent provided in an appropriation law or other legislative authority providing for payment of claims in accordance with 49 U.S.C. 70113, and to the extent the total amount of such covered claims arising out of any particular launch or reentry:
\begin{enumerate}
\item Exceeds the amount of insurance required under §440.9(b); and
\item Is not more than \$1,500,000,000 (as adjusted for inflation occurring after January 1, 1989) above that amount.
\end{enumerate}
\item Payment by the United States under paragraph (a) of this section shall not be made for any part of such claims for which bodily injury or property damage results from willful misconduct by the party seeking payment.
\item The United States shall provide for payment of claims by third parties for bodily injury or property damage that are payable under 49 U.S.C. 70113 from the first dollar of loss up to \$1,500,000,000 (as adjusted for inflation occurring after January 1, 1989).
\item Payment by the United States of excess third-party claims under 49 U.S.C. 70113 shall be subject to:
\begin{enumerate}
\item Prompt notice by the licensee to the FAA that the total amount of claims arising out of licensed activities exceeds, or is likely to exceed, the required amount of financial responsibility. For each claim, the notice must specify the nature, cause, and amount of the claim or lawsuit associated with the claim, and the party or parties who may otherwise be liable for payment of the claim;
\item Participation or assistance in the defense of the claim or lawsuit by the United States, at its election;
\item Approval by the FAA of any settlement, or part of a settlement, to be paid by the United States; and
\item Approval by Congress of a compensation plan prepared by the FAA and submitted by the President.
\end{enumerate}
\end{enumerate}
\end{itemize}
whether Congress would appropriate money to fund this liability provision should the question arise. The U.S. Government's indemnification policy does not cover risks associated with commercial spaceport operations that do not involve launch vehicles.141

**Tier 3: Beyond Governmental Indemnification.** If both the first and second tiers are inadequate the compensate for the loss, the liability burden is placed on the legally liable party (potentially the licensee or permittee).142

This liability sharing arrangement was deemed necessary to promote commercial development of space activities, for U.S. space policy has long been driven by a desire to promote commercial launches, reentry and launch sites with stable and minimal regulatory oversight.143 The FAA described the rationale for this *quid pro quo* sharing of liability as follows:

Both the commercial space industry and the U.S. Government benefit from the statutory risk sharing arrangement. Under the quid pro quo arrangement . . . . the aerospace industry is relieved, in part, of the consequences of catastrophic liability which would be financially burdensome, if not impossible, to cover through private insurance. And, the government benefits by having its liability risk covered at no cost to the government, thereby insulating it financially, up to the prescribed amount. The government's liability exposure arises by virtue of its involvement in licensed activities through use of its property, personnel, facilities, equipment and services to support operations, and as a result of treaty obligations under which the government accepts absolute liability for damage on the ground or to aircraft in flight, outside of the United States, when the United States is deemed a launching State under the terms of the Outer Space Treaties . . . . Liability for damage caused elsewhere, such as on orbit damage, is also accepted by the government as a launching State under the Liability Convention but only if the damage is the fault of persons for whom the launching State is responsible. Under Article VI of the [Outer Space Treaty] the United States bears international responsibility for national activities in outer space, including those carried on by non-governmental entities.144

E. LIABILITY WAIVERS

The U.S. government seeks to reduce liability exposure by requiring that licensee and permittees enter into reciprocal waivers of claims agreements,\textsuperscript{145} “with each of its contractors and subcontractors, each customer and each of the customer's contractors and subcontractors, under which each party waives and releases claims against all the other parties to the waiver and agrees to assume financial responsibility for property damage it sustains and for bodily injury or property damage sustained by its own employees, and to hold harmless and indemnify each other from bodily injury or property damage sustained by its employees, resulting from a licensed or permitted activity, regardless of fault.”\textsuperscript{146} Such reciprocal claims waivers also are required for any “licensed or permitted activity in which the U.S. Government, any agency, or its contractors and subcontractors is involved . . .”\textsuperscript{147}

\textsuperscript{145} 14 CFR § 440.17 Reciprocal waiver of claims requirements.
\textsuperscript{146} 14 CFR § 440.17(b).
\textsuperscript{147} 14 CFR § 440.17(c). The U.S. Federal Aviation Administration summarizes operation of the reciprocal waiver provisions as follows:

Under the [Commercial Space Launch Act], reciprocal waivers of claims are required among launch participants and reentry participants, respectively, in order to relieve each of them of the threat and cost of inter-party litigation, and the associated need to obtain liability insurance covering their potential liability to other participants in a launch or
Pursuant to regulations promulgated by the US Federal Aviation Administration, the operator must notify both the crew and the space flight participants of the risks involved, and must secure a waiver of claims against the US government from them both. The regulations are silent on the issue of reciprocal waivers between the launch provider and space tourists.

An operator must inform any individual serving as crew that the United States Government has not certified the launch vehicle and any reentry vehicle as safe for carrying flight crew or space flight participants. An operator must provide this information—

- Before entering into any contract or other arrangement to employ that individual; or
- For any crew member employed as of December 23, 2004, as early as possible and prior to any launch in which that individual will participate as crew.

An operator must inform each space flight participant in writing about the risks of the launch and reentry, including the safety record of the launch or reentry vehicle type. An operator must satisfy the requirements of this section. An operator must inform each space flight participant of the risks of the launch and reentry, including the safety record of all launch or reentry vehicles that have carried one or more persons on board, including both U.S. government and private sector vehicles. This information must include—

- The total number of people who have been on a suborbital or orbital space flight and the total number of people who have died or been seriously injured on these flights; and
- The total number of launches and reentries conducted with people on board and the number of catastrophic failures of those launches and reentries.

An entity's agreement to be responsible for losses suffered by its employees may be termed a legislatively-mandated contractual indemnification obligation under which each party agrees to hold harmless and indemnify other participants in the licensed activity against whom one's employee has made a claim.

The CSLA further directs the government to waive claims for itself and for its contractors and subcontractors involved in a licensed launch or reentry and assume certain financial responsibility. However, the government's waiver of claims for property damage is limited to claims in excess of insurance required to cover government property and property belonging to government contractors and subcontractors involved in supporting the licensed activity, at a Federal range. The government does not accept financial responsibility for covering losses sustained by employees of the government or its contractors and subcontractors, referred to in the final rule as “Government personnel,” except to the extent claims for Government personnel losses exceed required insurance. Rather, claims of Government personnel are intended to be covered under the licensee’s liability insurance policy as third party claims and are considered by the FAA in establishing liability insurance requirements for the licensed activity.


49 CFR § 460.9 Informing crew of risk.

- An operator must inform in writing any individual serving as crew that the United States Government has not certified the launch vehicle and any reentry vehicle as safe for carrying flight crew or space flight participants. An operator must provide this information—
  - Before entering into any contract or other arrangement to employ that individual; or
  - For any crew member employed as of December 23, 2004, as early as possible and prior to any launch in which that individual will participate as crew.

49 CFR § 460.45 Operator informing space flight participant of risk.

- An operator must inform each space flight participant that the United States Government has not certified the launch vehicle and any reentry vehicle as safe for carrying crew or space flight participants.
- An operator must inform each space flight participant that the United States Government has not certified the launch vehicle and any reentry vehicle as safe for carrying crew or space flight participants. This information must include—
  - The total number of people who have been on a suborbital or orbital space flight and the total number of people who have died or been seriously injured on these flights; and
  - The total number of launches and reentries conducted with people on board and the number of catastrophic failures of those launches and reentries.


- Each member of a flight crew and any remote operator must execute a reciprocal waiver of claims with the Federal Aviation Administration of the Department of Transportation in accordance with the requirements of part 440.
- The operator's safety record must cover launch and reentry accidents and human space flight incidents that occurred during and after vehicle verification performed in accordance with §460.17, and include—
  - The number of vehicle flights,
Whether contractual waivers would be enforceable would be determined under common law contractual principles. One might argue that this process of notification of risks mandated by statute creates a defense of assumption of risk for those risks explicitly identified should a crew member or “space flight participant” suffer injury.

In order to promote the development of spaceports, a number of individual states within the United States have promulgated legislation limiting or absolving spaceport operators and launch providers from liability under state tort law. While these laws may preclude suits brought in state courts in these jurisdictions, it is doubtful they would be held binding on suits brought in other jurisdictions unless conflicts of law rules imposed the launching state’s liability laws upon the transaction. For example, the vehicle operator might draft the contract of carriage in a way imposing the law of the launching state in its dispute resolution clause. So long as such a clause was not unconscionable or against public policy, and in an environment of truthful and full disclosure, such a clause might be upheld, and liability be limited.

VII. CONCLUSION

As this essay reveals, States that have ratified either the Outer Space Treaty, the Rescue Agreement, and/or the Liability Convention have explicitly subjected themselves to unlimited liability for damage caused by space objects launched from their territory or facilities, or objects they launched or whose launch they procured. States are liable not only for damages caused by their own activities in space, but also for their commercial operators. Moreover, general principles of customary international law may subject them to liability independent of these treaties.

In order to protect their national treasury, citizenry and property from loss, many States have enacted domestic Space Laws which require commercial space entities to procure insurance, indemnify the State should it become liable for damage, and indemnify others. In

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(2) The number of accidents and human space flight incidents as defined by section 401.5; and
(3) Whether any corrective actions were taken to resolve these accidents and human space flight incidents.
(e) An operator must inform a space flight participant that he or she may request additional information regarding any accidents and human space flight incidents reported.
(f) Before flight, an operator must provide each space flight participant an opportunity to ask questions orally to acquire a better understanding of the hazards and risks of the mission, and each space flight participant must then provide consent in writing to participate in a launch or reentry. The consent must—
(1) Identify the specific launch vehicle the consent covers;
(2) State that the space flight participant understands the risk, and his or her presence on board the launch vehicle is voluntary; and
(3) Be signed and dated by the space flight participant.

49 CFR § 460.49 Space flight participant waiver of claims against U.S. Government.

Each space flight participant must execute a reciprocal waiver of claims with the Federal Aviation Administration of the Department of Transportation in accordance with the requirements of part 440 of this chapter.

151 Id. at 599-605. Appalachian Insurance Co. v. McDonnell Douglas Corp., 214 Cal. App. 3d 1; 262 Cal. Rptr. 716; 1989 Cal. App. LEXIS 977; CCH Prod. Liab. Rep. P12,297 (Cal. App. 1989) (In an action brought by plaintiff insurers for negligence and strict products liability arising from the failure of a rocket purchased by plaintiffs’ insured, the court held that the words of contract precluded a suit by plaintiffs’ insured against defendant manufacturers of a failed rocket, were not unconscionable and did not conflict with the public interest.)
152 See e.g., Virginia Spaceflight and Immunity Act, Va. CODE ANN. §§ 8.01-227.8, 8.01-227.9, 8.01-227.10 (West 2007), discussed in Michael Mineiro, Law and Regulation Governing U.S. Commercial Spaceports: Licensing, Liability, and Legal Challenges, 73 J. Air L. & Com. 759, 797-98 (2008).
order to promote commercial space investment, a few States have capped liability, or required commercial operators to waive it, in order to shield private investors from catastrophic loss.

As commercial activities in space proliferate, more States will join the growing family of space-faring nations. Those States would be well advised to promulgate national Space Laws regulating commercial space activity, licensing operators, ensuring they are financially fit, safe and environmentally responsible. Those national laws should also provide for insurance and indemnification. Further, caps on and waivers of liability may be desirable for promotional purposes, at least during the nascent developmental period.